

## CLAIMS

### WHAT IS CLAIMED IS:

1. An assembly for an article of manufacture, the assembly  
5 comprising:
  - a first member of the article of manufacture;
  - a second member of the article of manufacture opposing the first member;
  - a first expandable material disposed between the first member and the  
10 second member, the first expandable material configured for expanding a first amount upon exposure to a condition; and
  - a second expandable material disposed between the roof bow panel and the outer roof panel, the second expandable material configured for expanding a second amount upon exposure to a condition, the first amount  
15 being greater than the second amount and the second amount being a volumetric expansion of about 5% to about 700%.
2. An assembly as in claim 1 wherein the first member is a panel and the second member is a panel.  
20
3. An assembly as in claim 2 wherein at least a portion of the first member or the second member is configured as part of a roof of an automotive vehicle.
- 25 4. An assembly as in claim 2 wherein the first expandable material is configured as a strip and the second expandable material is configured as a strip, both strips extending longitudinally with the panels.
- 30 5. An assembly as in claim 4 wherein the first expandable material is configured as a plurality of strips and the second expandable material is also configured as a plurality of strips.

6. An assembly as in claim 4 wherein the strip of the first expandable material is an extruded strip.

7. An assembly as in claim 2 wherein the first expandable material  
5 has a post expansion density from about  $0.005 \text{ g/cm}^3$  to about  $0.15 \text{ g/cm}^3$  and the second expandable material has a post expansion density of about  $0.16 \text{ g/cm}^3$  to about  $0.8 \text{ g/cm}^3$ .

8. An assembly as in claim 2 wherein the first expandable material  
10 has a weight percentage of curing agent that is at least 10% less than a weight percentage of curing agent for the second expandable material.

9. An assembly as in claim 2 wherein the second expandable material has a higher strength than the first expandable material upon  
15 expansion.

10. An assembly as in claim 4 wherein the strip of the second expandable material is positioned adjacent a structural feature of at least one of the first member and the second member.

20

11. An assembly as in claim 10 wherein the structural feature is a pair of protrusions and the strip of the second expandable material is positioned between the pair of protrusions.

25 12. A roof assembly for an automotive vehicle, the assembly comprising:

a roof bow panel of the automotive vehicle;

an outer roof panel of the automotive vehicle generally opposing and substantially parallel to the roof bow panel;

30 a first expandable material disposed between the roof bow panel and the outer roof panel, wherein:

i) the first expandable material is configured for expanding a first amount upon exposure to a condition, the first amount being a

volumetric expansion of between about 300% to about 800%;  
and

a second expandable material disposed between the roof bow panel  
and the outer roof panel, wherein;

- 5           i)     the second expandable material is configured for expanding a  
              second amount upon exposure to a condition, the second  
              amount being a volumetric expansion of between about 15%  
              and about 250%; and
- ii)    the first material includes a weight percentage of blowing agent  
10               that is 30% greater than a weight percentage of blowing agent in  
              the second material;

13.   An assembly as in claim 12 wherein the first expandable  
material is configured as a strip and the second expandable material is  
15   configured as a strip, both strips extending longitudinally with the roof bow  
panel and the outer roof panel.

14.   An assembly as in claim 13 wherein the first expandable  
material is configured as a plurality of strips and the second expandable  
20   material is also configured as a plurality of strips.

15.   An assembly as in claim 13 wherein the strip of the first  
expandable material is an extruded strip.

25       16.   An assembly as in claim 12 wherein the first expandable  
material has a post expansion density from about  $0.005 \text{ g/cm}^3$  to about  $0.15 \text{ g/cm}^3$   
and the second expandable material has a post expansion density of  
about  $0.16 \text{ g/cm}^3$  to about  $0.8 \text{ g/cm}^3$ .

30       17.   An assembly as in claim 12 wherein the first expandable  
material has a weight percentage of curing agent that is at least 10% less  
than a weight percentage of curing agent for the second expandable material.

18. An assembly as in claim 12 wherein the second expandable material has a higher strength than the first expandable material.

19. An assembly as in claim 14 wherein the strip of the second expandable material is positioned adjacent a structural feature of at least one of the first member and the second member and wherein the structural feature is a pair of protrusions and the strip of the second expandable material is positioned between the protrusions.

20. A roof assembly for an automotive vehicle, the assembly comprising:

a roof bow panel;

an outer roof panel generally opposing and substantially parallel to the roof bow panel;

a first expandable material disposed between the roof bow panel and the outer roof panel, wherein:

i) the first expandable material is configured for expanding a first amount upon exposure to a condition, the first amount being a volumetric expansion of between about 300 % to about 800 %;

and

ii) the first expandable material includes at least 35% by weight ethylene copolymer;

a second expandable material disposed between the roof bow panel and the outer roof panel, wherein;

i) the second expandable material is configured for expanding a second amount upon exposure to a condition, the second amount being a volumetric expansion of between about 15% and about 250%;

ii) the second material includes a weight percentage of blowing agent that is 30% greater than a weight percentage of blowing agent in the second material; and

iii) the second material includes at least 35 % by weight of an epoxy material.

21. An assembly as in claim 20 wherein the first expandable material is configured as a strip and the second expandable material is configured as a strip, both strips extending longitudinally with the panels.

5

22. An assembly as in claim 21 wherein the first expandable material is configured as a plurality of strips and the second expandable material is also configured as a plurality of strips.

10

23. An assembly as in claim 21 wherein the strip of the second expandable material is positioned adjacent a structural feature of at least one of the first member and the second member and wherein the structural feature is a pair of protrusions and the strip of the second expandable material is positioned between the protrusions.

15